CLAIMS

1. A liquid spraying apparatus comprising:

a carrying means for carrying an object onto which liquid is to be projected in a predetermined direction;

a liquid spraying means having nozzles to spray and project the liquid as droplets onto the object having been carried to a position where the object faces the nozzles;

a liquid-spraying controlling means for controlling the liquid spraying means to spray the droplets from the nozzles in predetermined timing;

an environment detecting means for detecting an ambient temperature and/or humidity when the droplets are sprayed from the nozzles;

a carrying-speed discriminating means for judging whether the carrying speed of the object has been changed or not; and

a storage means having stored therein liquid-spraying control data intended for controlling the liquid-spraying timing for each type of the object,

when the carrying-speed discriminating means has determined that the object carrying speed has been changed, the liquid-spraying controlling means controlling the liquid-spraying means on the basis of the environment data detected by the environment detecting means and liquid-spraying control data stored in the storage means to spray the droplets from the nozzles in different timing from that which is before the carrying speed is changed.

2. The apparatus according to claim 1, wherein:

the liquid spraying means has a plurality of the nozzles disposed side by side in the object-carrying direction to spray the droplets toward the object first from the upstream nozzle in the object-carrying direction and finally from the downstream one in this order in the object-carrying direction; and

the liquid-spraying controlling means controls, taking a position to which the droplets sprayed from the nozzle located downstream in the object-carrying direction as a reference droplet-projected position, the liquid spraying to spray the droplets from the other nozzle than the nozzle located downstream in the different timing from that which is before the carrying speed is changed for the droplets sprayed from the other nozzle than the one located downstream to be projected to a generally same position as the reference droplet-projected position before the nozzle located downstream sprays the droplets.

3. The apparatus according to claim 1, wherein

the carrying means is located upstream in the object-carrying direction in relation to the liquid spraying means; and

the carrying means includes a feed roller that rotates about its own axis and a delivery roller located downstream in the object carrying direction in relation to the liquid spraying means to rotate about its own axis at a higher speed than the feed roller,

the feed and delivery rollers carrying nearly simultaneously the object having

been carried to a position opposite to the nozzles to hold the object tight in a direction in the plane of the liquid-spraying surface.

4. The apparatus according to claim 1, wherein the carrying-speed discriminating means includes a trailing-end sensor located upstream of the liquid-spraying means in the object-carrying direction to detect the trailing end of the object in the carrying direction and which determines, in a predetermined time after the trailing-end sensor has detected the trailing end of the object, that the carrying speed has been changed.

5. The apparatus according to claim 1, wherein of the liquid-spraying means, the nozzles are disposed side by side generally in line in a direction generally perpendicular to the object-carrying direction.

6. A liquid spraying method to be employed in a liquid spraying apparatus comprising:

a carrying means for carrying an object onto which liquid is to be projected in a predetermined direction;

a liquid spraying means having nozzles to spray and project the liquid as droplets onto the object having been carried to a position where the object faces the nozzles;

a liquid-spraying controlling means for controlling the liquid spraying means to spray the droplets from the nozzles in predetermined timing;

an environment detecting means for detecting an ambient temperature and/or humidity when the droplets are sprayed from the nozzles;

a carrying-speed discriminating means for judging whether the carrying speed of

the object has been changed or not; and

a storage means having stored therein liquid-spraying control data intended for controlling the liquid-spraying timing for each type of the object,

whereby when the carrying-speed discriminating means has determined that the object carrying speed has been changed, the droplets are sprayed from the nozzles in different timing from that which is before the carrying speed is changed on the basis of the environment data detected by the environment detecting means and liquid-spraying control data stored in the storage means.

7. The method according to claim 6, wherein:

a plurality of the nozzles is disposed side by side in the object-carrying direction to spray the droplets toward the object first from the upstream nozzle in the object-carrying direction and finally from the downstream one in this order in the object-carrying direction; and

a position to which the droplets sprayed from the nozzle located downstream in the object-carrying direction being taken as a reference droplet-projected position, the liquid spraying is controlled to spray the droplets from the other nozzle than the nozzle located downstream in the different timing from that which is before the carrying speed is changed for the droplets sprayed from the other nozzle than the one located downstream to be projected to a generally same position as the reference droplet-projected position before the nozzle located downstream sprays the droplets.

8. The method according to claim 7, wherein as the carrying means, there are

provided a feed roller located upstream of the liquid-spraying means in the object carrying direction to rotate about its own axis, and a delivery roller located downstream of the liquid-spraying means in the object carrying direction to rotate about its own axis at a higher speed than the feed roller,

the object having been carried to a position opposite to the nozzles being carried by the feed and delivery rollers almost simultaneously to hold the object tight in a direction in the plane of the liquid-spraying surface.

9. The method according to claim 6, wherein the carrying-speed discriminating means includes a trailing-end sensor located upstream of the liquid-spraying means in the object-carrying direction to detect the trailing end of the object in the carrying direction and which determines, in a predetermined time after the trailing-end sensor has detected the trailing end of the object, that the carrying speed has been changed.

10. The method according to claim 6, wherein the nozzles are disposed side by side generally in line in a direction generally perpendicular to the object-carrying direction.

11. A liquid spraying apparatus comprising:

a carrying means for carrying an object onto which liquid is to be projected in a predetermined direction;

a liquid spraying means having nozzles to spray and project the liquid as droplets onto the object having been carried to a position where the object faces the nozzles;

a liquid-spraying controlling means for controlling the liquid spraying means to spray the droplets from the nozzles in predetermined timing;

an environment detecting means for detecting an ambient temperature and/or humidity when the droplets are sprayed from the nozzles;

a carrying-speed discriminating means for judging whether the carrying speed of the object has been changed or not;

a droplet-projected position detecting means for detecting a displacement of droplet-projected position, which arises when the droplets are projected in a predetermined pattern on the object being carried because the object carrying speed has been changed;

a data generating means for generating, for each type of the object onto which the droplets are projected in the predetermined pattern, liquid-spraying control data intended for controlling the liquid-spraying timing to correct the displacement of droplet-projected position detected by the liquid-protected position detecting means; and

a storage means for storing the liquid-spraying control data generated by the data generating means for each object type,

when the carrying-speed discriminating means has determined that the object carrying speed has been changed, the liquid-spraying controlling means controlling the liquid-spraying means on the basis of the environment data detected by the environment detecting means and liquid-spraying control data for each object type, stored in the storage means, to spray the droplets from the nozzles in different timing from that which is before the carrying speed is changed.

12. The apparatus according to claim 11, wherein

the liquid spraying means has a plurality of the nozzles disposed side by side in the object-carrying direction to spray the droplets toward the object first from the upstream nozzle in the object-carrying direction and finally from the downstream one in this order in the object-carrying direction;

the droplet-projected position detecting means detects, taking a position to which the droplets sprayed from the nozzle located downstream in the object-carrying direction are projected as a reference droplet-projected position, a displacement of the position to which the droplets sprayed from the other nozzle than the one located downstream are projected from the reference droplet-projected position; and

the data generating means generates the liquid-spraying control data intended for controlling the timing of liquid spraying from the other nozzle than the one located downstream so that the droplets sprayed from the other nozzle than the one located downstream will be projected to the generally same position as the reference droplet-projected position before the nozzle located downstream sprays the droplets.

13. The apparatus according to claim 11, wherein:

the carrying means is located upstream in the object-carrying direction in relation to the liquid spraying means; and

the carrying means includes a feed roller that rotates about its own axis and a delivery roller located downstream in the object carrying direction in relation to the liquid spraying means to rotate about its own axis at a higher speed than the feed

roller,

the feed and delivery rollers carrying nearly simultaneously the object having been carried to a position opposite to the nozzles to hold the object tight in a direction in a direction in the plane of the liquid-spraying surface.

14. The apparatus according to claim 11, wherein the carrying-speed discriminating means includes a trailing-end sensor provided upstream in the object-carrying direction in relation to the liquid-spraying means to detect the trailing end of the object in the carrying direction and which determines, in a predetermined time after the trailing-end sensor has detected the trailing end of the object, that the carrying speed has been changed.

15. The apparatus according to claim 11, wherein the storage means has pre-stored therein the liquid-spraying control data for the type of the object.

16. The apparatus according to claim 11, wherein of the liquid-spraying means, the nozzles are disposed side by side generally in line in a direction generally perpendicular to the object-carrying direction.

17. A liquid spraying method to be employed in a liquid praying apparatus comprising:

a carrying means for carrying an object onto which liquid is to be projected in a predetermined direction;

a liquid spraying means having nozzles to spray and project the liquid as droplets onto the object having been carried to a position where the object faces the nozzles;

a liquid-spraying controlling means for controlling the liquid spraying means to spray the droplets from the nozzles in predetermined timing;

an environment detecting means for detecting an ambient temperature and/or humidity when the droplets are sprayed from the nozzles;

a carrying-speed discriminating means for judging whether the carrying speed of the object has been changed or not;

a droplet-projected position detecting means for detecting a displacement of droplet-projected position, which arises when the droplets are projected in a predetermined pattern on the object being carried because the object carrying speed has been changed;

a data generating means for generating, for each type of the object on which the droplets are projected in the predetermined pattern, liquid-spraying control data intended for controlling the liquid-spraying timing to correct the displacement of droplet-projected position detected by the liquid-protected position detecting means; and

a storage means for storing the liquid-spraying control data generated by the data generating means for each object type,

whereby when the carrying-speed discriminating means has determined that the object carrying speed has been changed, the liquid-spraying controlling means controls the liquid-spraying means on the basis of the environment data detected by the environment detecting means and liquid-spraying control data for each object type,

stored in the storage means, to spray the droplets from the nozzles in different timing from that which is before the carrying speed is changed.

18. The method according to claim 17, wherein:

a plurality of the nozzles is disposed side by side in the object-carrying direction to spray the droplets toward the object first from the upstream nozzle in the object-carrying direction and finally from the downstream one in this order in the object-carrying direction;

a position to which the droplets sprayed from the nozzle located downstream in the object-carrying direction are projected being taken as a reference droplet-projected position, a displacement of the position to which the droplets sprayed from the other nozzle than the one located downstream are projected from the reference droplet-projected position is detected by the droplet-projected position detecting means; and

the liquid-spraying control data, intended for controlling the timing of liquid spraying from the other nozzle than the one located downstream so that the droplets sprayed from the other nozzle than the one located downstream will be projected to the generally same position as the reference droplet-projected position before the nozzle located downstream sprays the droplets, is generated by the data generating means.

19. The method according to claim 17, wherein as the carrying means, there are provided a feed roller located upstream of the liquid-spraying means in the object

carrying direction to rotate about its own axis, and a delivery roller located downstream of the liquid-spraying means in the object carrying direction to rotate about its own axis at a higher speed than the feed roller,

the object having been carried to a position opposite to the nozzles being carried by the feed and delivery rollers almost simultaneously to hold the object tight in a direction in the plane of the liquid-spraying surface.

20. The method according to claim 17, wherein the carrying-speed discriminating means includes a trailing-end sensor located upstream of the liquid-spraying means in the object-carrying direction to detect the trailing end of the object in the carrying direction and which determines, in a predetermined time after the trailing-end sensor has detected the trailing end of the object, that the carrying speed has been changed.

21. The method according to claim 17, wherein the liquid-spraying control data for the type of the object is pre-stored in the storage means.

22. The method according to claim 17, wherein the nozzles are disposed side by side generally in line in a direction generally perpendicular to the object-carrying direction.